

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of:

Unlicensed Operation in the TV Broadcast
Bands

ET Docket No. 04-186

COMMENTS OF TELCORDIA TECHNOLOGIES

PROPOSAL SEEKING TO BE DESIGNATED AS A TV BAND DEVICE DATABASE MANAGER

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INTRODUCTION

Telcordia Technologies, Inc. (hereafter Telcordia) herein responds to the Public Notice from the Office of Engineering and Technology (OET) as an interested entity to be designated as a TV band database manager(s)¹ and proposes to provide a complete solution including all the basic components.

Telcordia Technologies as a leading global provider of telecommunications software and services for IP, wireline, wireless and cable networks is demonstrably qualified to perform this function. The company delivers flexible, standards-based solutions that optimize complex network and business support systems, enabling customers to manage, transform and grow their businesses.

Telcordia's depth and breadth of experience is evident in products that touch nearly every corner of telecommunications, from the infrastructure upon which one of the world's largest telephone networks is built, to the rapidly expanding IP and mobile markets. Over the years², Telcordia has generated more than 1800 patents and has developed a rich history as an agent of change in the telecommunications industry. Telcordia has both spectrum and industry leading database clearinghouse design and management expertise that are important for provision of the TV Band Device Database function.

¹ Public Notice entitled "Office of Engineering and Technology Invites Proposals from Entities Seeking to be Designated TV Band Device Database Managers", DA-09-2479, 11/25/2009

² Telcordia Technologies, Inc. was formerly Bell Communications Research (BELLCORE) formed from the Bell System in 1984 and was renamed Telcordia Technologies when it was sold to SAIC by the Bell companies. It is an independent company as a result of a leveraged buyout from SAIC in 2001.

Telcordia proposes a secure database design with competitive business plan estimates that supports our position for multiple database managers/administrators. Telcordia will provide a complete solution as one of multiple TV Band Device Database Managers including all the basic components including the data repository, a data registration process and a query process. The following sections provide the details regarding Telcordia's proposal to the Commission for managing the TV band database and the associated responses to the five requests for information in the Public Notice.

QUESTION 1

1. *The entity must demonstrate that it possesses sufficient technical expertise to administer a TV band database. It must demonstrate that it has a viable business plan to operate a database for the five-year term set forth in Section 15.715(g) of the rules. To the extent that the proponent will rely on fees from registrations or queries, the proposal should describe the fee collection process.*

Telcordia Response:

- **Technical Expertise**

Telcordia is a leading developer of mission-critical communications support systems for governments, operators and a broad spectrum of commercial enterprises. We participate and hold leadership roles in numerous standard bodies to help create synergy for the industry, to maximize resources, and to help speed innovation into the marketplace. Over the years, Telcordia has generated more than 1800 patents and has developed a rich history as an agent of change in the telecommunications industry.

Telcordia has effectively provided products, services and solutions for over 25 years to the telecommunication industry. The following description lists some examples of related products and services demonstrating technical expertise in administering a TV band database. These examples include a combination spectrum management expertise and centralized national database and hosting services that is unique and detailed more fully below.

Telcordia through its subsidiary InterConnect Communications (ICC) has deep and broad worldwide spectrum management competence developed over the past 25 years. It has provided engineering, economics and legal support direct to 40 spectrum regulators and 25 wireless network operators in consulting projects from a few weeks through to several years duration. Examples of ICC spectrum management expertise include:

- Interference calculations or the interpretation of incoming calculations or the validation of interference calculation methods proposed by others;
- Algorithm selection and development for direct interference calculation or for interpretation of external interference calculations;
- Testing of real-life assignments made by the developed and managed spectrum management database; verification of database function against requirements and provision of ongoing audit;
- Ongoing development of the database and its algorithms through engagement with industry, providing world-class highly experienced spectrum engineers to engage with stakeholders.

In addition, Telcordia's InterConnect Communications has evaluated, specified, procured and implemented spectrum management systems for all size of regulator and administration in countries across the globe. Successful projects include:

- Worked to support the installation of a new state-of-the-art national spectrum management and monitoring system in a Central European country and develop institutional capabilities to ensure optimal use of the new system;

- Assisted an Eastern European government modernize and enhance its spectrum management systems to meet prevailing technical requirements and international norms;
- Provided design, system specification and procurement support for a Southern African regulator's radio spectrum management and monitoring system including:
- Undertaking a review of existing systems and evaluation of these against prevailing and anticipated needs;
- Providing 'hands on' training in using the new system under 'operational' conditions.

Telcordia's InterConnect Communications services harness the provision of "consulting in communications regulation and strategy." This experience precisely meets the FCC's requirements in managing the whitespace database. The combination of Telcordia standards expertise and ICC's spectrum management expertise is unparalleled.

In addition to this significant spectrum management and standards expertise, Telcordia has the added experience of designing and operating interconnection related clearinghouse and database solutions since its inception in 1984. Below are some of the mission critical solutions that Telcordia has implemented in North America.

- Telcordia Routing Administration (TRA) - , TRA has enabled the efficient exchange of NANP-Wide Routing, Rating & Billing Data for the last 35 years. TRA has managed over 1 million constantly evolving routing and rating data records and the Telcordia LERG™ Routing Guide and the Telcordia TPM™ Data

Source are the industry standards for exchange or routing and rating information respectively.

- Centralized Message Distribution System (CMDS) - Clearinghouse service that processes billable message information for inter-exchange between local exchange carriers. Over 7 Million messages per day and 2.5 billion records exchanged annually.
- Service Management System/800 (SMS/800) Number Management, Service Provisioning & Porting of Toll Free Telcordia has processed *billions of toll-free calls* in the United States without a single service interruption. 24 million toll-free numbers have been administered and 15 million numbers have been ported.
- Hosted Solutions - Telcordia's Hosted/Managed Services are empowering Mobile Service Providers, including a new breed of innovative Mobile Virtual Network Operators (MVNOs) to extend their brands into mobile services -- opening up new revenue opportunities without the costs associated with building and managing a complex mobile network infrastructure.

In the Number Portability area Telcordia provides clearinghouse database systems and operator support systems in the following countries: USA, Canada, Mexico, Brazil, Greece, Lithuania, Norway, Egypt, South Africa, Oman, Saudi Arabia, Turkey, Pakistan, Malaysia and India (production launch early 2010). Telcordia provides number portability clearinghouse database solutions in more countries than any company in the world.

In each of these large, complex database projects, Telcordia has demonstrated a deep understanding of regulatory mandates, telecom operations and network interdependencies with the ability to reach consensus among stakeholders on controversial technical and business issues as a trusted and neutral third party. These qualifications along with the demonstrated spectrum management and standards expertise demonstrate that Telcordia is more than capable to design, build, deploy and manage a TV Band Device Database.

- **Business Plan**

The revenues in Telcordia business plan will be derived from a onetime fee for each device registration and may also include separate charges for added value services. The Telcordia business plan will provide for a competitive registration fee and makes a conservative estimate of volumes. If the registration volumes are within Telcordia's estimates, the service will be a viable business for Telcordia. In any case Telcordia is a large and viable provider of telecommunications software and services and it will stand behind this business when selected.

- Volume Forecast

Although studies exist implying that the opportunity for unlicensed access for devices and services maybe in the multibillion dollar range by 2015³ for the US economy, the Telcordia business plan utilizes a conservative model based on the recent WiFi (802.11) stationary device growth. The number of chip sets shipped

³ <http://www.ingeniousmedia.co.uk/news/press-releases/p1/927> - "The Economic Value of Unlicensed Spectrum", September, 2009

in 2008 for stationary devices was approximately 48M. The business plan extrapolates that number over a five year period and assumes a reasonably small number of administrators are chosen to support the device manufacturers. The following chart depicts the base estimate of the number of devices available for registration per year for Telcordia. Telcordia assumes roughly 20% of the devices would be directly registered in the Telcordia TV band database.

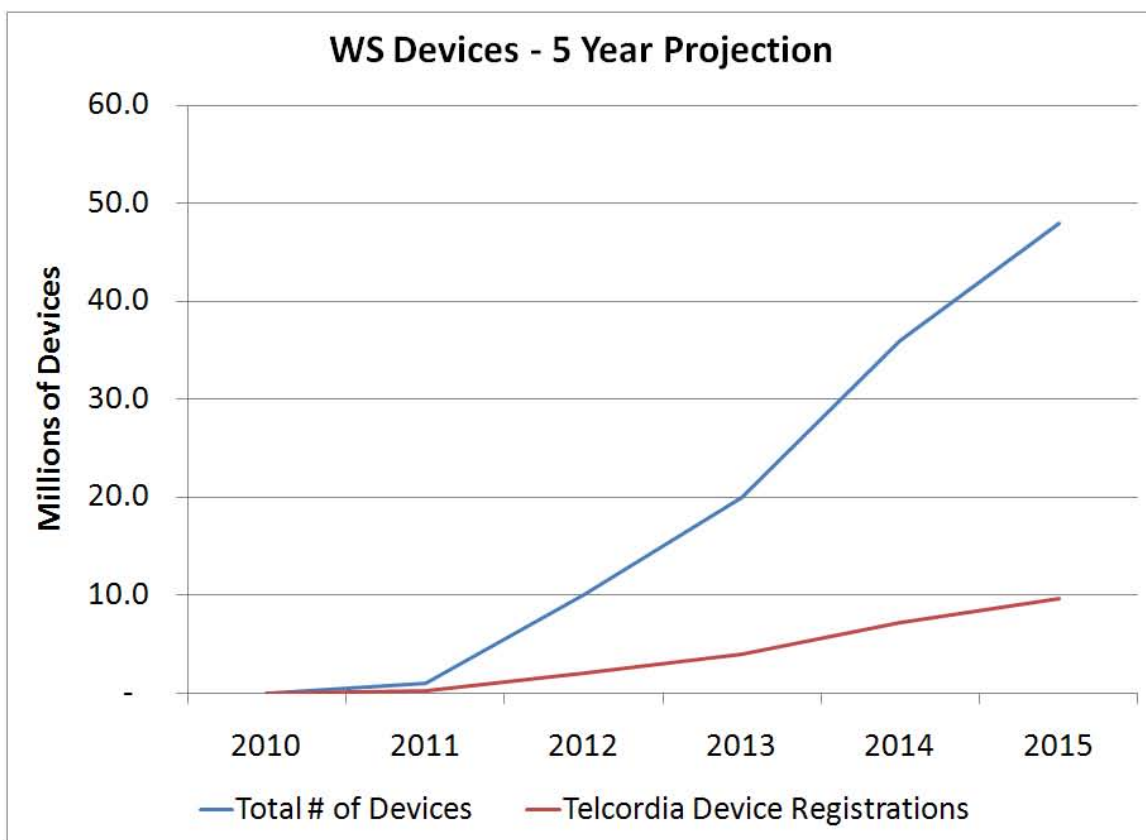


Figure 1: WS Device Growth

- Pricing and Billing

Telcordia assumes a tiered base pricing method for the registration fee with discounts based on annual volume. Additionally, value added services may be

provided at an additional fee based on the level of service requested by the White Space (WS) device aka TV Band Device (TVBD). More exact pricing can be provided under confidential seal when the OET or the FCC, as appropriate, provide final design requirement details. Telcordia will not charge for device queries to the database.

Telcordia will make billing arrangements with each device manufacturer that chooses the Telcordia service as its device registration database.

QUESTION 2

2. *The entity must describe in detail the scope of the database functions that it intends to perform, such as managing a data repository, performing calculations to determine available channels, and/or registering fixed unlicensed devices and licensed services not listed in the Commission's databases, or how it will have functions performed in a secure and reliable manner by another entity. The entity must also describe how data will be synchronized between multiple databases if multiple databases are authorized and how quickly this synchronization of data will be accomplished.*

Telcordia Response:

Telcordia intends to provide a complete solution including all the basic components such as the data repository, a data registration process and a query process. The following describes the solution database functions.

- **Database Functions**

- **Data repository**

The proposed solution provides the capabilities to support data collection from FCC sources and other sources and storing the data in a normalized form usable as input for subsequent calculations when determining available channels. Examples of data sets collected from FCC sources (e.g. CDBS, ULS, EAS, etc.) include Digital TV stations, Class A TV stations, low power TV stations, TV translator and booster stations, Broadcast Auxiliary Service (BAS) stations, PLMRS stations, CMRS stations, Offshore radiotelephone service stations. Examples of data sets collected from existing sources other than the FCC include Cable television headend receive sites, TV translator receive sites, sites where low power auxiliary stations (including

wireless microphones and wireless assist video devices) are used and their schedule for operation. Also included in the data repository function any reference data and rules for calculating interference protection. Reference data examples would include locations for radio astronomy services, lists of devices that are required to receive “no channels available,” etc. An example of a stored rule in its descriptive text version would be “for translator receive sites and cable headends registered in the TV bands database TVBDs may not operate within an arc of +/-30 degrees from a line between the registered translator or cable headend receive site and the TV station being received within a distance of 80 km from the protected contour for co-channel operation and 20 km from the protected contour for adjacent channel operation. Outside of this +/- 30 degree arc, TVBDs may not operate within 8 km from the receive site for co-channel operation and 2 km from the receive site for adjacent channel operation,” etc.⁴

- **Performing calculations to determine available channels**

The solution provides the capability to perform the appropriate calculations to determine the availability of channels.

The Telcordia TV bands database will determine the available channels at a location using the interference protection requirements of § 15.712 (e.g., required minimum separation distances, protected contour levels, etc.), the location information supplied by a TVBD, and the data for protected stations/locations in the database. The TV

⁴ See 47 C.F.R. § 15.712 for interference protection reference data and rules, Telcordia notes that the particular rule cited as an example only is subject to an ex-parte by the National Cable & Telecommunications Association filed December 22, 2009.

bands database will also check for proximity of a TVBD to the Canadian and Mexican borders where operation may be prohibited.⁵

The use of R-6602 (F-curves) is required to compute the protected service area contours as is the standard FCC procedure.

- **Registering fixed unlicensed devices and devices not listed in Commission's database**

The solution provides the capabilities to register fixed unlicensed devices and devices not listed in the Commission's database. These capabilities include a Web Portal for manual loading and an automated interface utilizing Web Services. The required information to be registered includes for each registrant type (e.g. cable headend, low power auxiliary station, etc.) the information specified in CFR 47§15.713. For example, for a Fixed Device the following information will/may be collected:

- Device FCC identifier
- Manufacturer's serial number of the device
- Device's geographic coordinates (latitude and longitude (NAD 83) accurate to +/- 50 m)
- Name of the individual or business that is responsible for the device
- Name of a contact person responsible for the device's operation
- Address for the contact person

⁵ See 47 C.F.R. § 15.713

- E-mail address for the contact person
- Phone number for the contact person
- Optional data⁶

- **Database Synchronization**

The proposed Telcordia solution supports multiple methods for synchronizing data between TV band databases. Telcordia supports a Web Service (using SOAP) for mechanized exchange of data based for example on a time range filter and will provide all of the required information registered by all the protected entities within that filter. This will provide for the ability to obtain near real time data for synchronization purposes. Telcordia will additionally make available in a secure fashion (e.g. Secure FTP) the data available in a flat file. The data will be made available as soon as it is stored persistently via the Web Service and written to a circular flat file periodically. It is assumed that 15 minute intervals would be sufficient for the file access given the data can be obtained in near real-time over the mechanized interface.

The Telcordia solution would also support a mutually agreed auditing mechanism between database administrators that can be implemented and utilized on reciprocal basis. This would allow database administrators the capability to periodically validate/report database contents.

⁶ Additionally Telcordia may support optional information to be provided during registration in support of future added value services.

QUESTION 3

3. *The entity must provide diagrams showing the architecture of the database system and a detailed description of how each function operates and how each function interacts with the other functions.*

Telcordia Response:

- **Solution Architecture**

The proposed solution logical architecture is depicted in Figure 2 below. The solution is derived from the rules set forth in the Second Report and Order⁷ and influenced by participation in related Industry organizations (e.g. Institute of Electrical and Electronics Engineers (IEEE) and the White Spaces Data Base (WSDB) Group).

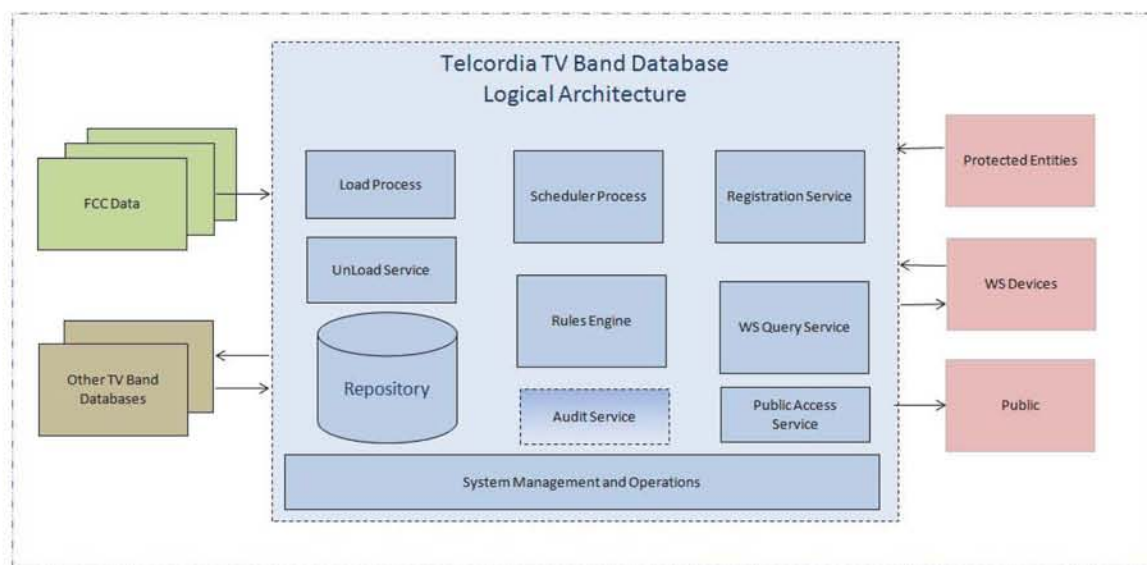


Figure 2: Telcordia Proposed Logical Architecture

⁷ Second Report and Order and Memorandum Opinion and Order, FCC 08-260, released November 14, 2008.

The Telcordia solution will also consist of a highly reliable and scalable hardware architecture and geographically diverse and reliable data centers.

- **Functions**

- Registration Service provides the secure external function to support protected entities and White Space Devices to directly register with the TV band database.
- WS Query Service provides the external function for the WS Device to query the TV and database and receive the list of available channels for that device's location based on WS Device operating parameters (e.g., fixed WS Device antenna height).
- Public Access Service provides the function to allow for the public to access the appropriate information via a Web based Portal. Some information (e.g., wireless microphone registration IDs) may be kept confidential.
- Scheduler Process provides the internal management function for "house keeping" and resetting data at the appropriate time.
- Rules Engine provides the functionality to access the Repository and apply all the appropriate TV band database operating rules based on the device and the protected entities contours at that geo location and return the available channels list to the WS Query Service
- Audit Service would provide the external interface to audit other TV band databases and/or present the appropriate information to an authorized audit request.

- Load Process provides the functionality to periodically extract the FCC data and normalize the data to be loaded into the Repository. The Load Process also interfaces to other TV band databases and extracts the protected entity registration information not directly registered.
- Unload Process provides the functionality to extract from the Repository the information requested (e.g. all registration information between a set time based range).
- Systems Management and Operations provide the operations, management and systems administration functions for the solution.
- Repository is the persistent store for the database and rules.

This is a logical view of the processes and their interoperation at a high level.

The architecture allows for the addition of new rules, data elements or services as needed by the industry or driven by changes to FCC regulations.

QUESTION 4

4. *If the entity will not be performing all database functions, it must provide information on the entities operating other functions and the business relationship between itself and these other entities. In particular, it must address how the Commission can ensure that all of the requirements for TV band database administrators in Section 15.715 are satisfied when database functions are divided among multiple entities, including a description of how data will be transferred among these various related entities and other databases if multiple databases are authorized and the expected schedule of such data transfers (i.e., real-time, once an hour, etc.).*

Telcordia Response:

The Telcordia solution proposes as a single entity to provide all of the required database functionality itself to allow for review of compliance with the requirements of §15.715 of the rules.

In addition, The Telcordia solution will support multiple database administrators and can support partitioning of functions if required. As described in the Database Synchronization response in Question 2 above, Telcordia supports near real-time database synchronization (e.g., through SOAP Web Services) with other administrators.

QUESTION 5

5. *The entity must describe the methods (e.g., interfaces, protocols) that will be used by TV band devices to communicate with the database and the procedures, if any, that it plans to use to verify that a device can properly communicate with the database. It must include a description of the security methods that will be used to ensure that unauthorized parties can not access or alter the database or otherwise corrupt the operation of the database system in performing its intended functions. In addition, the entity should describe whether and how security methods will be used to verify that Mode I personal/portable devices that rely on another device for their geographic location information have received equipment authorization.*

Telcordia Response:

- **TV Band devices**

In general, for TV band database and WS device communications, the proposed protocol supported will be eXtensible Markup Language (XML) encodings using Simple Object Access Protocol (SOAP) transported on HTTP protected via Transport Layer Security (TLS) unless otherwise noted. TLS allows database authentication and link encryption using well-tested industry-standard methods. The XML encoded attributes will include all required parameters documented in the rules.

- **Security Methods**

The following describes the security mechanisms proposed for the interfaces and data in the solution as referenced in the Architecture Diagram in Figure 2 above.

- WS Device to TV band database

The interface between the WS Device (Fixed or Mode II) and the TV band database is used to register a device and querying for available channel list and can be protected using TLS. TLS supports mutual authentication and message confidentiality between communicating end points. It also has mechanisms to prevent message tampering and message forgery. Telcordia supports the use of digital certificates to authenticate the database provider, and the use of shared secrets to authenticate the WS device. If digital certificates are desired for WS device authentication, several options are available.

- Protected entity to TV band database

The interface between a protected entity and the TV band database to register protected entities can be protected using industry standard TLS. It supports authentication and message confidentiality between communicating end points. It also has mechanisms to prevent message tampering and message forgery. Supporting authentication of each protected entity to the TV band database would require the deployment of PKI certificates at each protected entity. Other methods of verifying protected entity authenticity are also possible (e.g., through FCC sources).

- TV band database to TV band database

Interfaces between different TV band database providers could be protected by making use of VPN tunnels or https interfaces (using the same digital certificates that are utilized to authenticate the database). Different flavors of VPN technologies are available. For example, the database can make use of a TLS

based VPN such as OpenVPN. OpenVPN is an open source VPN technology that has been widely used for several years. Each TV band database provider's tunnel end point would need to be associated with a PKI certificate to support mutual authentication between them.

- Public Web access to TV band database

Public access (read only) to the TV band database does not need to be authenticated at the client side. TLS in conjunction with a server side certificate can be used to authenticate the identity of the TV band database provider to the public access client. Though much of the information contained in the database is public (e.g., from the FCC's CDBS and ULS), certain information in the database may not be made public (e.g., WS device and registered protected entity identifying information).

- General Security for data/data center

The data center being used by the TV band database provider will be protected in several ways using common mechanisms. The database contents will be encrypted either using a 3rd party database encryption product or native file system support (e.g. on Linux, NTFS). Access to the database server from a database client will be authenticated in both directions. This can be done using TLS with two-way authentication enabled. Host based intrusion detection systems will be employed at machines running database servers and clients to detect unauthorized activity at these machines (e.g. unauthorized client invocation).

Periodic audits will be performed on the database. Firewalls between the database front ends (e.g. Web Servers) and external clients will ensure connections utilize authorized ports and all non-authorized services are blocked. Database access rights will be granted based on the identity of the database user. For example, protected entities may need modification privileges while WS devices may only be granted read privileges. Finally, network intrusion detection and mitigation mechanisms will be used to minimize network attack related down times for the TV band database provider. In addition to intrusion detection systems, the architecture will include redundancy in all network connections and components.

- **Mode I Personal/Portable Devices**

If the Commission determines that Mode I device authentication is necessary, the same methods described above (e.g., shared secret methods) can be employed to authenticate those devices. Telcordia believes that significant value first needs to be determined before this is required due to the significant increased message volume (traffic load) between the TV band database and the WS Device.

CONCLUSION

Telcordia proposes a complete solution that is secure, highly reliable and scalable database design that provides for near real time synchronization among multiple database administrators. Telcordia will provide a complete solution as one of multiple TV Band Device Database Managers including all the basic components including the data repository, a data registration process and a query process.

Telcordia continues to support that the Commission require that there be and name multiple administrators for the reasons it has previously provided⁸. Not only is a multiple administrator regime pro-competition allowing manufactures vendor choice, it also provides for better scaling as the number of devices registered and querying the database(s) increases, and it allows for enhanced data availability via several administrators.

Telcordia believes that the combination of spectrum management and standards expertise combined with its experience in building, deploying and managing critical infrastructure database solutions makes it a clear choice as one of the TV Band Device Database administrators.

⁸ See Telcordia ex-parte letter 10/9/2009 in ET 04-186.

Respectfully submitted,

/s/ John P. Malyar

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